Intra-Technique Combination at DGFI: some aspects related to DORIS

B. MEISEL, D. ANGERMANN

Deutsches Geodätisches Forschungsinstitut (DGFI)
Marstallplatz 8, D-80539 München, Germany

email: meisel@dgfi.badw.de

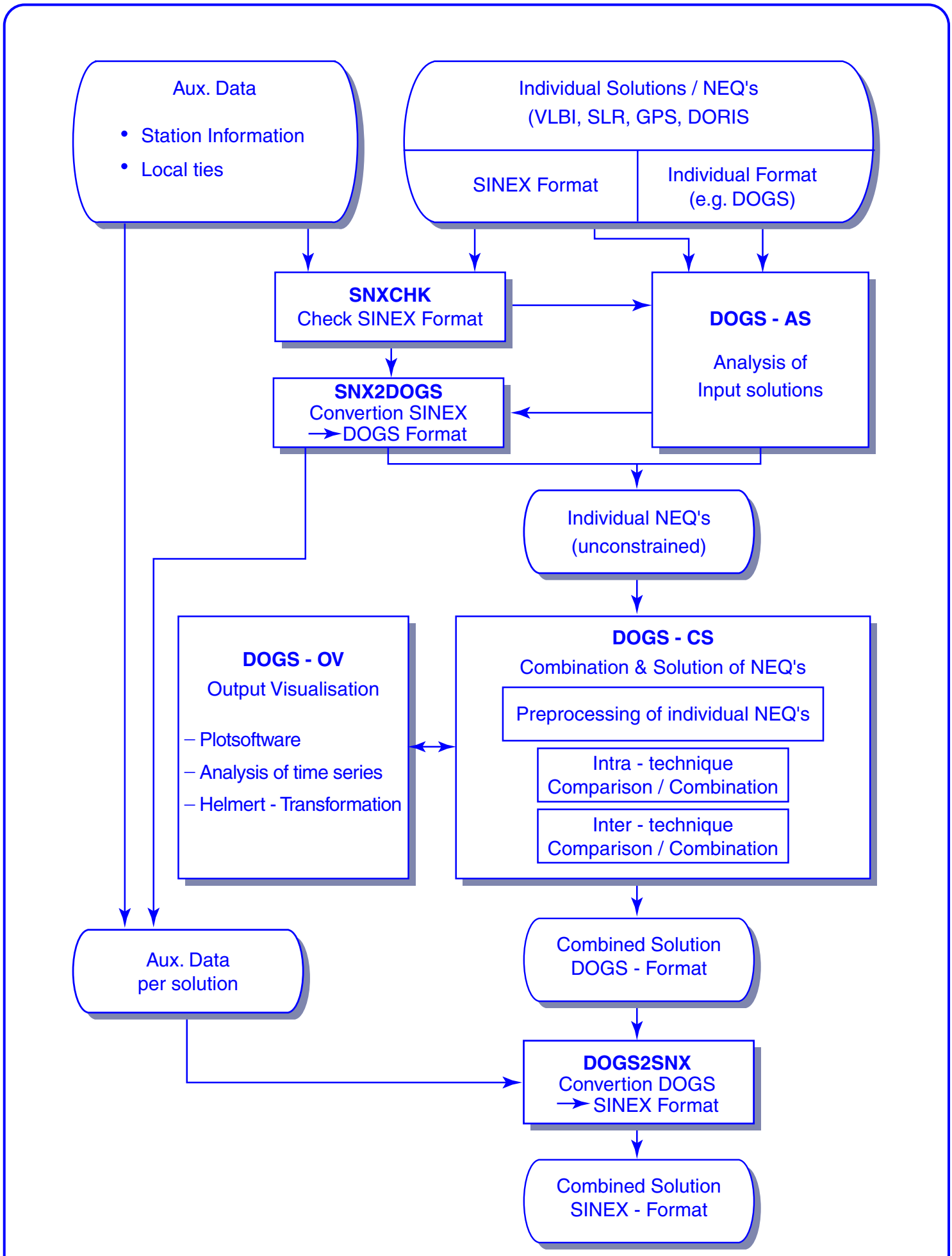
IDS Analysis Workshop, 20 -21 February 2003

DGFI FGS Forschungsgruppe Satellitengeodäsie GEOTECHNOLOGIEN

Outline

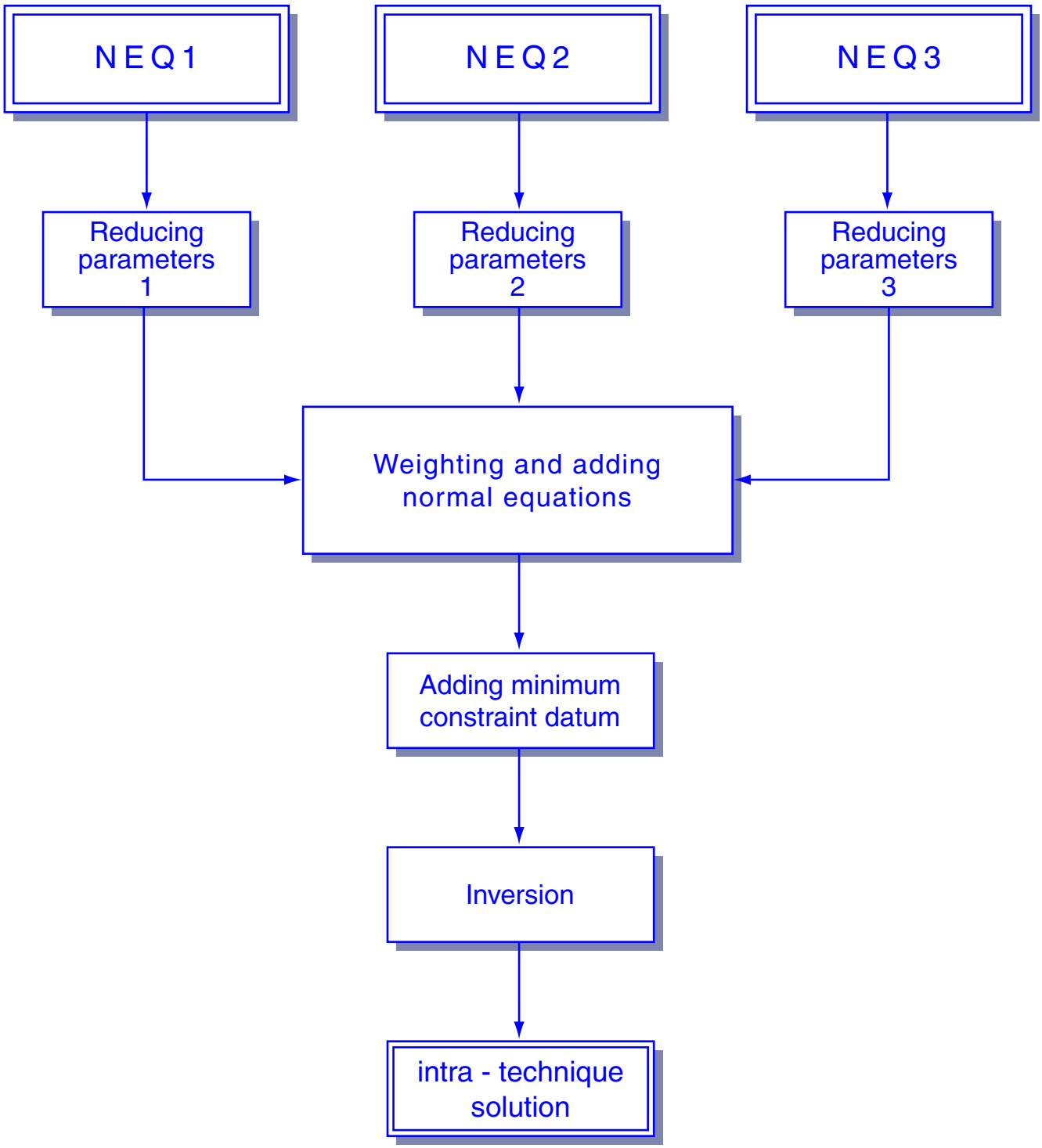
1. Overview
2. Datum definition
3. Weighting
4. Setting velocities equal
5. Reducing parameters
6. Recommendations

DGFI FGS Forschungsgruppe Satellitengeodäsie GEOTECHNOLOGIEN



DGFI FGS Forschungsgruppe Satellitengeodäsie GEOTECHNOLOGIEN

Intra - technique Combination



Data Sets

Solution	*Data Span*	*Stations original*	*Stations included*	*Datum*	*Source*
(IGN)02D04	1993-2002	111	109	loose / free net.	CDDIS
(GRGS)00D01	1993-1998	70	69	minimum dat.	ITRF 2000

Helmert-Transformation on ITRF 2000

Positions:

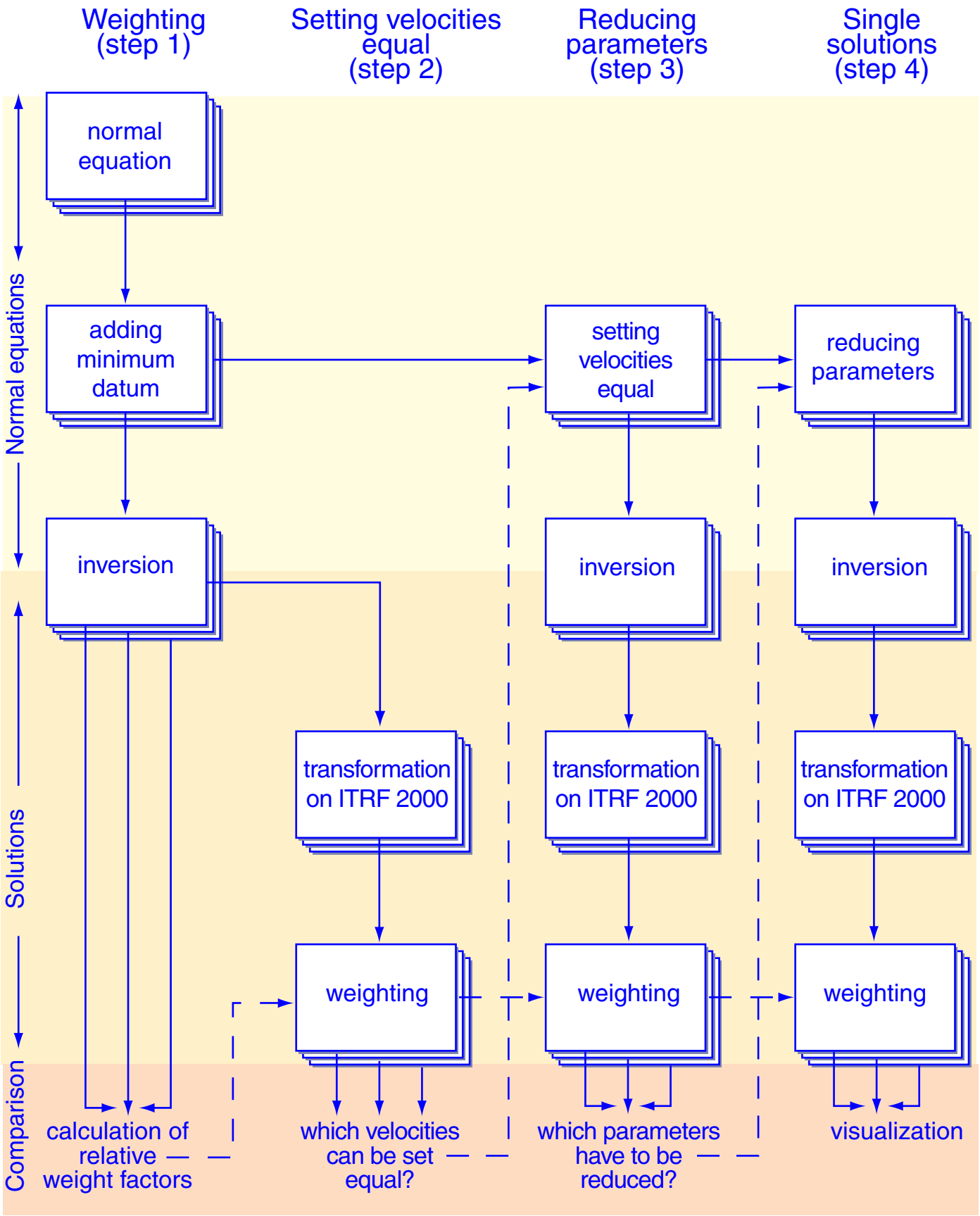
	IGN	*GRGS*
Tx [cm]	-1,14	1,57
Ty [cm]	0,0	0,47
Tz [cm]	-1,86	-8,49
Sc [ppm]	-0,0038 ≙ -2,44 cm	0,007 ≙ 4,5 cm

Velocities:

	IGN	*GRGS*
Tx [cm]	-0,01	-0,06
Ty [cm]	-0,12	-0,09
Tz [cm]	0,11	-0,15
Sc [ppm]	0,00	0,00029 ≙ 0,18 cm

DGFI FGS Forschungsgruppe Satellitengeodäsie GEOTECHNOLOGIEN

Intra - technique Comparison



DGFI FGS Forschungsgruppe Satellitengeodäsie GEOTECHNOLOGIEN

Datum definition

- Minimum constraints
  - No net rotation and no net translation conditions
  - On station coordinates and velocities
  - Depending on the degrees of freedom of the normal equation

- A subset of good stations was used to define the datum conditions

- The condition equations were added as pseudo observations to the normal equations.

DGFI FGS Forschungsgruppe Satellitengeodäsie GEOTECHNOLOGIEN

Weighting

- The niveau of the standard deviations might be (slightly) different for the individual solutions (e.g. due to different weighting models, model deficiencies, ...)

- To make sure that a single solution does not dominate the intra-technique combined solution it is essential to calibrate them against each other

- We compute for each single solution mean standard deviations for the positions by using a subset of good stations and use the resulting numbers for the computation of relative scaling factors.

Relative Weight

	σ^2
GRGS	1,0
IGN	0,2

Setting velocities equal

- On sites where more than one station of the same technique has observed, the velocity estimates should be identical, if the site motions are identical and systematic effects negligible.
- In reality these assumptions are not fulfilled for a number of sites (e.g. due to earthquakes, changes in instrumentation, ...)
- Therefore the velocities of different occupations should not automatically be identical.
- We use the ratios of the difference in velocities divided by the corresponding standard deviations to decide whether velocites should be set equal or not.

Occupations	Site	IGN		
		Δ_{vel}	σ_{vel}	Δ/σ
12329S001/12	Sakhalins		10.6	2.3
12329S001/13			13.5	2.3
12329S001/23			12.8	3.6
12349S001/12	Krasnoyarsk		18.0	2.7
12602S011/12	Dionysos		17.8	1.9
23501S001/12	Colombo		4.9	3.5
40503S004/12	Socorro Island		205.9	3.8
42202S005/12	Arequipa		46.0	5.0

Tab. 2: Equation DORIS velocities

Reducing parameters

- Descrepancies in the station coordinates or velocities between different (single-) solutions can lead to deformations in the combined intra-technique network.
- Therefore it is essential to identify possible outliers in the individual solutions.
- We implemented an iterative method for the outlier detection.
- Criteria are the absolute difference of a parameter in a single solution with respect to the other solutions and the ratio of this difference devided by the corresponding standard deviation.

Recommendations

- Report constraints in SINEX files (SOLUTION / MATRIX-APRIORI or SOLUTION/APRIORI) and/or submit unconstrained normal equations
- Define a subset of DORIS "core stations" that can be used for datum defintion, transformation, etc.
- Velocities of different occupations at the same site should not be set equal
- Reference list for DORIS site information (domes number, 4-char-ID, epochs, solution numbers, ...)
- Report solution statistics block (degrees of freedom, ...) in SINEX files

DGFI FGS Forschungsgruppe Satellitengeodäsie GEOTECHNOLOGIEN